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■ Glossary of terms used in the module specification

Absolute maximum ratings

Absolute maximum ratings define maximum operating conditions that, if exceeded even for a short period of time, may cause permanent damage to an output range, a channel or the whole module. Such damage may be exhibited as performance degradation such as a larger offset or gain error, or functional failure such as total output failure.

Output signal range

The output signal range is the nominal output range. A $\pm 5\%$ over range is added to the output signal range to give the actual output range, which is simply called the "output range" and indicated within parentheses in the module specification.

Allowable load resistance

The allowable load resistance specifies either the maximum or minimum load resistance allowed for each output, depending on the output type. If the module is operated with a load exceeding this limit, local overheating may result in component failure or the full output range may not be available.

Allowable capacitive load

The allowance capacitive load specifies a limit on voltage output as a necessary condition for prevention of output oscillation. This value is tested by evaluation but is not a guaranteed value.

Allowable inductive load

The allowance inductive load specifies a limit on current output as a necessary condition for prevention of output oscillation. This value is tested by evaluation but is not a guaranteed value.

Output update time

The output update time is the time required for D/A conversion by the module. It is the time required for D/A conversion plus the time for the required change in voltage or current output to appear at the output terminal of the module after an output value is written to the module by the CPU module.

Synchronous output

The synchronous output function updates DACs of all active channels of the same module synchronously and is used to suppress difference in update timing between output channels. By specifying an update trigger channel, outputs of the other channels are updated synchronously whenever the output value of the trigger channel is updated.

Output response time

This is the time required for signal change from 10% to 90% level after an output change is instructed to the module.

Output resolution

The output resolution is the voltage or current value corresponding to the least significant bit of the DA converter. The smallest change in actual output voltage or current value is affected by the digital values specified for the scaling function.

Overall accuracy

The overall accuracy specifies output repeatability by expressing output error as a percentage of the output signal range. Two values are specified, one excluding the effect of ambient temperature ($23^{\circ}\text{C}\pm 2^{\circ}\text{C}$) and the other including the effect of ambient temperature (0 to 55°C). As overall accuracy is affected by scaling, it is specified assuming default values for scaling.

Scaling function

The scaling function enables the high limit and low limit of the output range to be set to any arbitrary value between -30000 and 30000 independently for each channel. The default values vary with the specified output range.

CPU fail-time output

Each channel can be configured independently to either hold its current output value or to output a specific value at CPU failure. In the latter case, the value is specified separately.

General Specification

F3DA04-6R/DCR Analog Output Module

FA-M3

GS 34M06H11-06E



General

The F3DA04-6R/DCR is a digital-to-analog conversion output module for use with the range-free controller FA-M3.

Features

- High-speed conversion and response
 - High DA conversion speed of 2 μ s per channel
 - Fast output response to update instructions of 2 μ s + 2 μ s x (number of channels to be updated)
 - Short output update interval between channels of 2 μ s
- High resolution and accuracy
 - 16-bit DAC ensures higher resolution and accuracy.
 - High output resolution of 0.2 mV for voltage output; high output resolution of 0.5 μ A for current output
 - High overall accuracy of voltage range $\pm 0.1\%$ of full scale (at 23 $\pm 2^\circ$ C) or current range $\pm 0.2\%$ of full scale (at 23 $\pm 2^\circ$ C)
- High functionality
 - DACs of all active channels of the same module (up to 8 channels) can be updated synchronously with a specified channel.
 - The output type and output range is configurable by software.

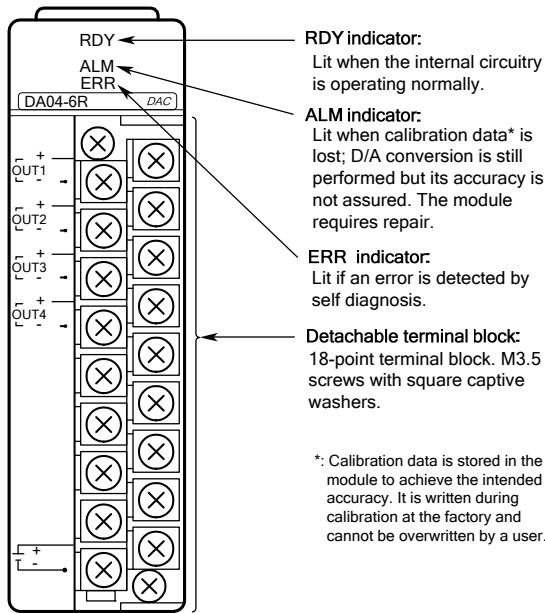
The specifications except default output signal range are the same as F3DA04-6R.

Specifications

Item	Specifications ¹⁾
Number of outputs	4
Absolute maximum ratings	Output terminals: No external voltage or current must be applied. Between the terminals of external power supply: 30 V max.
Isolation	Between output terminals and internal circuitry: Isolated (capacitance coupling), capable of withstanding 500 V DC for 1 minute. Between output terminals or between output terminals and external power supply: Not isolated, common negative
Output signal range	Voltage output: -10 to 10 V (-11 to 11 V) 0 to 10 V (-0.5 to 10.5 V) 0 to 5 V (-0.25 to 5.25 V) 1 to 5 V (0.1 to 5.25 V) Current output: 4 to 20 mA (1.25 to 21 mA) (default) 0 to 20 mA (-1 to 21 mA) -20 to 20 mA (-21 to 21 mA)
Output impedance	Voltage output: 0.5 Ω max. Current output: 3 M Ω max. Impedance at disabled output: 1 M Ω min. Leakage current at disabled output: ± 0.5 μ A max.
Allowable load resistance	Voltage output: 1 k Ω min. (for -10 to 10 V or 0 to 10 V range); 500 Ω min. (for 0 to 5 V or 1 to 5 V range) Current output: 600 Ω min.
Allowable capacitive load	Voltage output: 20 nF max.
Allowable inductive load	Current output: 1 mH max., electropneumatic converter PK-5502 or equivalent
Output update time ²⁾	2 μ s + 2 μ s x (number of channels to be updated) For instance, 4 μ s if one channel is updated, or 10 μ s if 4 channels are updated.
Synchronous output ³⁾	DAC of all active channels of the same module can be updated synchronously.
Output response time	Voltage output: ≈ 20 μ s (for -10 to 10 V range with 2 k Ω load) Current output: ≈ 10 μ s (for 4 to 20 mA range with 250 Ω load)
Output resolution (16-bit DAC)	Voltage output: ≈ 0.5 mV (for -10 to 10 V or 0 to 10 V range); ≈ 0.2 mV (for 0 to 5 V or 1 to 5 V range). Current output: ≈ 0.5 μ A (for 4 to 20 mA range) ≈ 1 μ A (for 0 to 20 mA or -20 to 20 mA range)
Overall accuracy	Voltage output: $\pm 0.1\%$ of FS (23 $\pm 2^\circ$ C with 10 M Ω load); $\pm 0.3\%$ of FS (0 to 55 $^\circ$ C with 10 M Ω load) Current output: $\pm 0.2\%$ of FS (23 $\pm 2^\circ$ C with 100 Ω load); $\pm 0.3\%$ of FS (0 to 55 $^\circ$ C with 100 Ω load)
Scaling	Output signal range can be set to any digital range within -30,000 and 30,000.
CPU fail-time output	The output behavior at CPU failure is configurable for each channel independently.
Current consumption	60 mA (excluding that of external power supply)
External power supply	Rated voltage: 24 V DC Allowable voltage range: 19.2 to 30 V DC Current consumption: 200 mA (inrush current: 1A)
External connection	18-point terminal block, M3.5 screws
External dimensions ⁴⁾	28.9 (W) x 100 (H) x 106.2 (D) mm
Weight	180 g
Surrounding air temperature range	Operating : 0 to 55 $^\circ$ C ⁵⁾ Storage : -20 $^\circ$ C to 75 $^\circ$ C
Surrounding humidity range	Operating : 10 to 90% RH (non-condensing) Storage : 10 to 90% RH (non-condensing)
Surrounding atmosphere	Must be free of corrosive gases, flammable gases or heavy dust.

- *1: The module must be supplied with an external power supply. All specifications assume that the external power supply is on.
- *2: The given output update time applies if the module is installed in the main unit and data to be updated is written collectively to the module using a WRITE instruction. Otherwise, 4 μs per channel is required.
- *3: The update period for synchronous output depends on the number of channels used and the user application.
- *4: Excluding protrusions (see External Dimensions for details).
- *5: Limited by usage conditions.

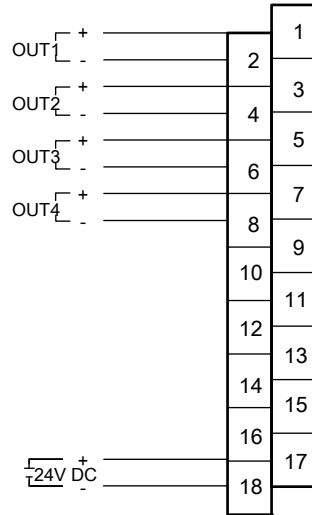
■ Components and Functions



■ Operating Environment

There is no restriction on the type of CPU modules that can be used with this module.

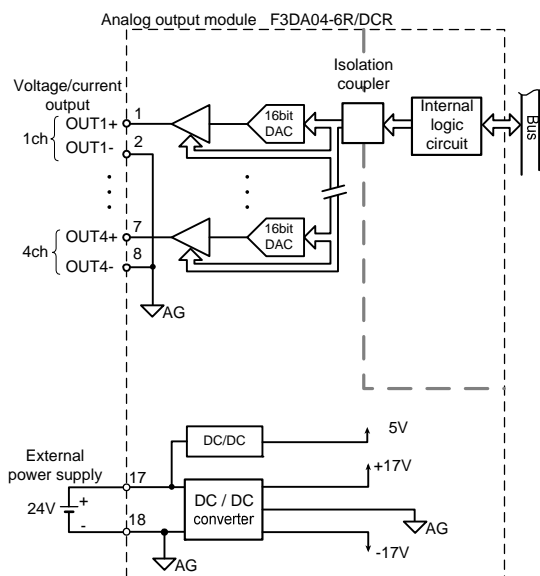
■ External Connection Diagram



■ Model and Suffix Codes

Model	Suffix Code	Style Code	Option Code	Description
F3DA04	-6R	/DCR	-10 to 10 V, 0 to 10 V, 0 to 5 V, 1 to 5 V, 4 to 20 mA, 0 to 20 mA and -20 to 20 mA, 4 outputs, 16-bit D/A conversion, 2 μs per channel

■ Internal Circuit Diagram



■ External Dimensions

